

The Audio League Report

ACOUSTIC RESEARCH AR-1

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I. General Description

At the 1954 New York Audio Fair, we heard a speaker system which made an unforgettable impression on us. We commented in Vol. 1, No. 2 of the Audio League Report on the exceptionally clean sound of the Acoustic Research AR-1 speaker system. Since then, we have tested and lived with the AR-1, (three of them, in fact), for several months, and have supplemented our initial impression with some substantial data presented in Section IV of this report. We are now using the AR-1/W as our reference speaker.

The AR-1 principle is so simple that one's first reaction to it might well be "Why didn't I think of that?" Perhaps any of us might have, but Edgar Villchur did think of it, and the result is a speaker system which he rather modestly claims "sets new standards of uniformity of frequency response and low distortion". Mr. Villchur's development specifically was the low frequency reproducer, designated AR-1/W which handles frequencies to 1000 cycles, and this is what we shall refer to in the first part of this report.

The AR-1/W is a fully enclosed box (25" wide x 14" high x 11½" deep), having no special internal features except a considerable number of stiffening members on its inner surfaces. It is one of the most rigid enclosures on the market, using ¾" plywood throughout except for the front panel which is 1-¼" thick. The 12" woofer (and 8" tweeter in the AR-1 model) are mounted from the front, flush with the surface, and the box is completely glued together (no removable panels). The tweeter compartment is completely isolated from the rest of the enclosure.

The entire interior volume of the AR-1 is filled with fibreglass which serves to damp any resonances which might tend to be excited within the enclosure.

Mr. Villchur has described the principle of his speaker system in Audio Magazine (October 1954) and July 1955). The technically minded reader is referred to these articles for an exceptionally lucid and informative discussion of the AR-1's features. For the benefit of those readers who do not have these articles available, we will give a somewhat oversimplified explanation in part III of this report.

The AR-1 system, physically the same size as the AR-1/W, contains a Western Electric 755A 8" speaker and a 1000-cycle crossover network. On the back of the cabinet are a number of binding post terminals. By means of a jumper connection, the tweeter level may be increased or decreased by 2 db compared to the normal setting. Exceptionally "live" or "dead" rooms may require this adjustment. By removing another jumper, the woofer section alone may be used with an external tweeter.

The AR-1 system is nominally a 4 ohm system. It gives its best performance when driven from an amplifier with a damping factor of 1, except when located in a corner when D.F. of 4 or more is satisfactory. In case an amplifier with a high damping factor (such as the Williamson or most of the better amplifiers on the market) is used, an internal 4-ohm resistor may be inserted in series with the speaker wiring by selection of the appropriate terminals. This gives a D.F. of 1 when used with any high D.F. amplifier, and also matches an 8-ohm amplifier output if no 4-ohm output is available. However, this wastes half the amplifier

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output in the resistor. This brings us to what may be the only serious drawback to the general use of the AR-1.

Most good bass-reflex speaker systems have efficiencies of 5-10%, depending on the quality of the speakers used in them. Front loaded corner horns of the Klipsch type may have efficiencies as high as 50%. The better infinite baffle systems, such as Bozak's, are at the other end of the scale, with efficiencies of the order of 2%. The AR-1 sets new standards for low efficiency - almost 1%. Practically speaking, this means that higher amplifier powers are required for the same volume level when using the AR-1 than when using any other system. Most speakers will deliver entirely adequate performance in the home with a 10-watt amplifier. For equivalent listening levels, an AR-1 should have at least 30 watts, and 50-70 watts is not an excessive power reserve.

This does not necessarily mean that one must scrap his present 15-watt amplifier upon acquiring an AR-1. We have found that any amplifier which delivers an honest 10 watts, down to 20 cycles, can do a perfectly satisfactory job in our 2700 cu. ft. living room - provided it is not "pushed". Any attempt to obtain unusually loud volumes will surely overload the amplifier. As a matter of fact, we haven't yet found an amplifier which didn't give up long before the AR-1 showed any signs of distress. During one of our recent panel listening tests, a MacIntosh MC-60 60-watt amplifier was driven to its maximum output without damage to the AR-1. We measured approximately 70 watts delivered to the speaker at 30 cycles without audible distortion. It was plenty loud, but did no permanent damage to the house or the panel members!

We believe that the increasing availability of 20-30 watt amplifiers at nearly the same price as 10-15 watt units should do much to nullify the disadvantage of relatively low speaker efficiency.

While we're on the subject of efficiency, if a speaker is to have flat response, a little thought will show that its efficiency can be no better than its lowest efficiency value within its claimed pass-band. Assume a speaker system with 10% efficiency at 100 cycles, but only 3% efficiency at 40 cycles and 1% at 30 cycles. The response of such a system will be down 10 db at 40 cycles and 20 db at 30 cycles, relative to its 100-cycle output. Now consider another system with 1% efficiency at 30 cycles and up. Its response will be flat from 100 cycles down to 30 cycles, instead of falling off steeply. At 30 cycles it is just as efficient as the first speaker, which might be advertised as being 10 times as efficient as the second (and also advertised as reproducing 30 cycles).

At the risk of getting a little ahead of ourselves, we can point out that at 25 cycles, and below, the "1% efficient" AR-1 is actually more ef-

ficient than the "50% efficient" Klipschorn. The latter gives up rather abruptly somewhere in the vicinity of 30 cycles and produces little fundamental energy, while the AR-1 can generate relatively undistorted fundamentals down to 20 cycles and below.

II. Subjective Appraisal

In this section, we will describe how the complete AR-1 system sounded to us, with a variety of program material.

First and foremost, it is clean. There is no fuzziness, boominess, or any of the usual speaker colorations, as far as the low and middle frequencies are concerned. At any level from a whisper to one which taxes the capabilities of a 70-watt amplifier, there is no sense of strain. One feels that this speaker doesn't know how to distort or overload in this range. Actually, any amplifier which can be carried by one man appears incapable of over-driving the AR-1.

The highs tend to be a little on the crisp side. They do not give the impression of effortless smoothness that characterizes the AR-1/W. Nevertheless, they are amazingly good for a conventional 8" cone speaker.

There is no sense of "divided sound", although the overall effect is of a relatively narrow sound source. This is inevitable when using a small cone speaker. Klipsch enthusiasts and other devotees of a wide source sound find this characteristic disturbing, and usually will continue to express a preference for their huge horns or other enclosures in spite of the demonstrable superior bass performance by the AR-1.

The second most striking property of the AR-1 is smoothness. It is free from peaks and holes in its response to an extent not approached by numerous other systems we have tested. Most noteworthy is the absence of any bass resonance in the 60-120 cycle region, where most speaker systems exhibit a pronounced peak. Male voices reproduce without any boominess. At first listening, one may conclude that the AR-1 is deficient in bass, since absolutely no bass will be heard if none is in the program material. It is startling to be listening to music which suggests that the woofer is inoperative, and suddenly to feel the fundamentals of a bass viol, piano, or organ, or the solid impact of a bass drum. Everything sounds a bit "different" on an AR-1, since it adds to or subtracts from the program material to a far lesser extent than any other system we have tested.

III. Principle of Operation of the AR-1/W.

In an infinite baffle, or fully enclosed speaker system, the low frequency resonance of the system is determined by the mass of the speaker moving system and air load, together with the compliance of the speaker cone and voice coil suspensions and the compliance of the air contained in the enclosure. In conventional systems, the air compliance is very high (the large volume of air is "springy" and has little stiffness), while the speaker compliance is rather low, due to the relatively stiff cone edge suspension and voice coil "spider". The electro-mechanical equivalent circuit shows these elements in series, so that the sum of the reactances of the speaker and air volume determines the resonant frequency.

In a conventional infinite baffle system, a commercial speaker with its stiff mechanical suspensions is used. In order to keep the resonance as low as possible, the air compliance must be high, which means a large volume. Anyone familiar with the better infinite baffle enclosures will appreciate this.

In the AR-1/W, a special 12" speaker is used. Its cone edge has a cloth suspension instead of the usual corrugated paper. This is not unique - a number of British speakers have cloth suspensions. However, instead of the customary voice coil spider, a large corrugated spider is fastened about half-way between the voice coil and the cone edge. As a result, the usual stiffness of the voice coil suspension has been greatly reduced. The cone can be moved axially for a considerable distance with the application of very little force. In other words, it has an extremely compliant suspension.

Let us assume that the mechanical compliance of this speaker is equal to the air volume compliance of the large infinite baffle previously mentioned. In order to have the same low frequency resonance as before, it will be necessary for the air volume compliance to be much lower, corresponding to the low compliance (high stiffness) of the conventional speaker. This means a much smaller air volume, hence a small enclosure. Thus, by exchanging air compliance for speaker suspension compliance, we have a system with the same low frequency performance as the conventional infinite baffle, but considerably reduced in size.

Inasmuch as the Villchur speaker has only about 10% of the normal suspension stiffness, a ten-fold volume reduction has been obtained. The internal volume of the AR-1/W is only 1.7 cubic feet, as compared to the 20-30 cubic ft. usually found in good infinite baffle installations. This is a tremendous step forward in the art of speaker design, yet we know that Mr. Villchur considers it secondary to the most remarkable characteristic of the AR-1/W - its low harmonic distortion, especially at low frequencies.

This is a direct result of the exchanging of air volume compliance for mechanical suspension compliance. One of the major sources of distortion in speakers is the non-linearity of their cone and voice coil suspensions. For a constant acoustic power output, the voice coil excursions increase as the frequency is lowered. Eventually, the conventional spiders and rim suspensions reach the limits of their travel and severe distortion results. Long before the limit is reached, some distortion is introduced by this non-linearity. In the AR-1/W, the mechanical system has only a 10% share in controlling the voice coil motion. The air volume provides 90% of the restoring force on the cone. Since air has linear elastic properties (under the conditions existing in this enclosure), it contributes no distortion. The practical effect of this is a roughly ten-fold reduction in harmonic distortion at very low frequencies (below 40-50 cycles), compared to even the best conventional speakers. It is for this reason that Acoustic Research advertisements invite comparison with any other speaker system, regardless of size or price.

The third outstanding characteristic of the AR-1 is its almost unbelievable low frequency response. It has been axiomatic in the past that extended lows required a large enclosure. The numerous small enclosures which have been offered in the past few years, and which frequently did amazingly well, nevertheless were limited to about 50 cycle response before they gave distorted or reduced output or both. Even some of the largest and most expensive corner horns exhibit serious weaknesses below 35 cycles. They cut off very sharply so that while their response may be excellent down to 35-40 cycles, little is left below 30 cycles. Only the huge Bozak B310 among standard commercial systems seems to have any appreciable response below 30 cycles.

There has to be an exception to every rule, and the AR-1 takes care of the "Large Enclosure" rule most adequately.

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As we have stated previously, the evaluation of speakers is so subjective that we do not consider it possible to say that one system is the best. Nevertheless, the completely outstanding low and mid-frequency performance of the AR-1/W has led us to select it as part of our reference speaker system. It may not be the best speaker made or sold today, but it is of sufficiently high quality so that any speaker comparable to it must be in the upper brackets of speaker performance. Frankly, we do not know, at this time, if there is another speaker system which can match or excel the low and midrange performance of the AR-1. We plan, in the reasonably near future, to compare the AR-1 with most of the large and presumably competitive speaker systems in the upper price and size brackets. We have listened to most of these competitive systems and of course have done extensive listening to the AR-1 and, on the basis of this listening, we still consider that the AR-1 sets new standards of low distortion, low frequency response.

Low frequencies alone do not make a speaker system. The middle and upper frequencies are of equal importance in producing balanced and satisfactory sound, and we feel that it is in the higher frequencies that the AR-1 exhibits whatever weaknesses it may have. By any ordinary or reasonable standard, the high frequency quality of the Western Electric 755A speaker used in the AR-1 is excellent. However, it would have to be of a high order indeed to be comparable to the low frequency portion of the system and unfortunately, in our opinion, it does not quite make the grade. Therefore, on an absolute basis, the AR-1/W can be considered an outstanding low frequency reproducer but the AR-1 system as such might have a tough time competing with speaker systems such as the Brociner Transcendent or the Bozak B310, both of which are noted for their unusually musical high frequency characteristics.

The major criticism of the AR-1's high frequency sound has been that it appears to come from a rather small source. This characteristic is in sharp contrast to the broad apparent sound source of the Klipschorns, the Bozak B310 or any of a number of large speaker systems. It is very probable that the narrower sound source is actually preferable for small rooms but for the listener with a large living room or who has formed a particular preference for the large or broad sound source, the AR-1 may prove less satisfactory than a physically larger system. The reader is referred to the report on the Janszen 1-30 Electrostatic Speaker System, appearing elsewhere in this issue, for a possible solution to this problem.

PART IV TECHNICAL REPORT

Acoustic Research is one of the very few speaker manufacturers who gives complete test data on their product. These conditions, including such items as solid angle seen by the speaker, amplifier damping factor, voltage input levels, etc., are completely described in their literature and in the articles published by Mr. Villchur. They claim that the reproducibility of their test data is an outstanding characteristic of their speaker.

In other words, its characteristics are so carefully controlled in manufacture that anyone who duplicates the essentials of their test set-up may obtain the same test results.

The AR-1 is designed to have a low frequency resonance of 43 cycles ± 1 cycle. Inasmuch as this frequency is substantially determined by the dimensions of the cabinet rather than by the speaker, it is possible for the manufacturer to hold this rather close tolerance in production. The response of the woofer portion, (that is, the AR-1/W, is stated to be within $\pm 1\frac{1}{2}$ db from 38 cycles to 1000

cycles, falling off gradually below 38 cycles until, at 30 cycles, it is down 6 db. Due to the excellent damping of the low frequency resonance, the rise at 43 cycles is only 1 db. Unfortunately, our test conditions did not duplicate the manufacturer's test conditions with sufficient precision to enable us to check these exact values. They do not appear to be inconsistent with the general characteristics we measured, however. The response of the high frequency portion of the AR-1 is stated to be within ± 5 db from 1000 to 13,000 cycles. Our judgment of its high frequency performance was based entirely on listening tests.

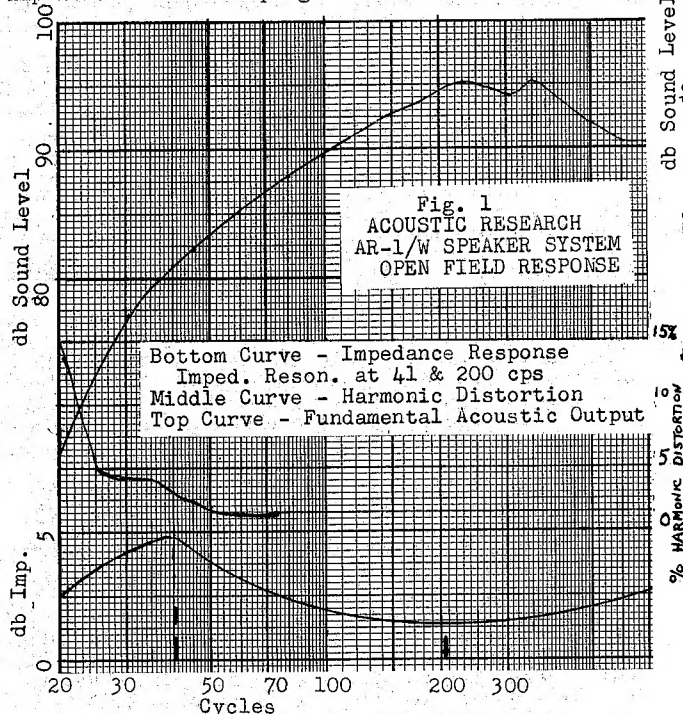
Since we are interested in proving or disproving a manufacturer's claims to the greatest possible extent, we attempted to duplicate the test conditions specified by Acoustic Research for our tests on its performance as a woofer. We were not successful in exactly duplicating them in one important respect. The response curves published by Mr. Villchur were taken with the speaker system buried in the ground, facing upward, with its front panel flush with the surface in order that it might see a 180° solid angle.

For various practical reasons, we did not dig a hole and bury our test speaker. Instead, we stood it upright in a normal playing position in an open field, with the microphone of our General Radio sound level meter 6 ft. in front of it on the axis of the woofer. When so located, the speaker sees a solid angle more nearly 360 degrees than 180 degrees. Therefore, its low frequency performance would be expected to suffer, and this was found to be the case. We use the term "suffer" in a relative sense, since, with any suffering it may have undergone, it stood ahead of any other speaker we have tested by a wide margin.

Reference to Fig. 1 will show the nature of the low frequency response of the AR-1/W in this test. The absence of sudden peaks or holes is noteworthy. The steady fall-off of low frequency response at a 12 db per octave rate below 100 cycles or thereabouts is characteristic of any 12" speaker, positioned in the manner in which our test speaker was positioned. Examination of speaker response curves in previous issues of The Audio League Report will show a similar behavior. It is in respect to harmonic distortion that the phenomenal performance of the AR-1/W becomes evident. At 30 cycles, only 5% total harmonic distortion was measured, as compared to values of 30% to 100% of other speaker systems we have tested. Furthermore, the distortion has only risen to 15% at 20 cycles, and we do not know how much lower it would have gone before becoming excessive since the test oscillator we used did not go below 20 cycles. At frequencies of 40 cycles and above, the distortion is of the order of 1.5% or less. There is no doubt that much of the distortion we were reading above 40 cycles was actually wind noise or possibly distortion in the microphone of the sound level meter.

These distortion figures were obtained with a substantial power input to the speaker. This power was measured in a manner defined by Mr. Villchur as "power into rated impedance". In the case of the AR-1, this meant that the amplifier output was set at 9 volts RMS at 175 cycles into the speaker with an amplifier damping factor of 1, and the amplifier gain was left untouched for the remainder of the test. In this way, the voltage across the speaker would rise or fall as its impedance rose or fell. A measurement of true power would require measurements of high voltage, current and phase angle at each frequency which would increase complexity of measurement enormously. For our other speaker tests, we have been maintaining a constant voltage at the speaker terminals. Therefore, as its impedance rose, the actual power delivered to the speaker fell. The concept of "power into rated impedance" was employed here without being specifically described. The reason for using an amplifier damping factor of 1 was simply because this was the test condition specified by Mr.

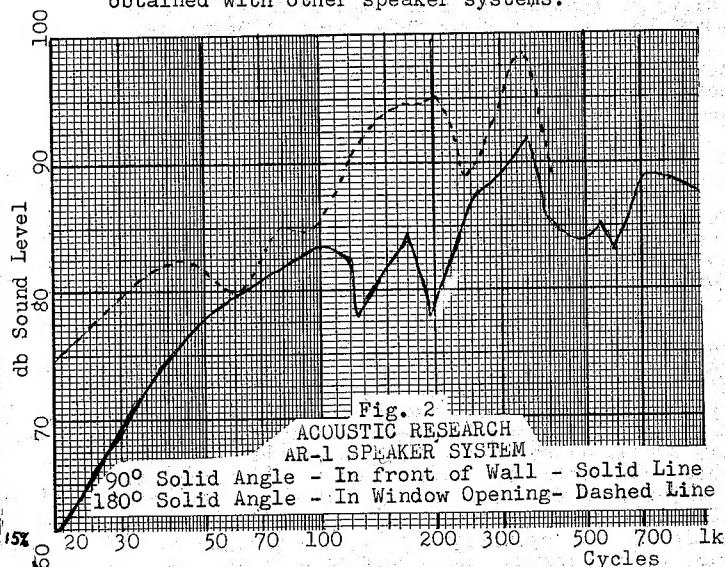
Villchur. In order to obtain optimum low frequency performance from the AR-1/W, a damping factor of 1 is required if the speaker is seeing a 180 degree solid angle. In the case of a 90-degree solid angle, such as mounting at a floor-wall junction in a mid-wall position, a damping factor of 2 is optimum. For corner mounting, a damping factor of 4 is called for, although higher damping factors than this will not seriously affect low frequency response in this position. To obtain a damping factor of 1, we used the 8-ohm terminals of the AR-1 which incorporated an internal 4-ohm resistor in series with the 4-ohm speaker system. We then maintained a constant voltage at the speaker terminals from an amplifier with a damping factor greater than 15. Under these conditions, the speaker was effectively being driven by an amplifier with a damping factor of 1.



We do not have the space here to reproduce Mr. Villchur's test curves which were published in Audio Magazine for July 1955. Any reader having access to this magazine will find it interesting to compare Mr. Villchur's test curves with ours. Because of the difference in acoustic environment between his tests and ours, the frequency response curves do not agree too well, but the harmonic distortion curves are extremely close to each other. In an attempt to come closer to Mr. Villchur's test conditions, we mounted the AR-1 in a window, flush with the surface of the house, facing outward. This presumably caused the speaker to see a 180-degree solid angle, and Fig. 2 shows the results of a low frequency response measurement made under these conditions. It will be observed that the low frequency performance below 100 cycles has been greatly improved and is not too different from the test results published by Mr. Villchur. However, the window in which the speaker was mounted acted as a resonant cavity and we found great variations in response above 100 cycles, resulting from such simple actions as pressing one's hand against the windowpane. Therefore, we cannot consider this test valid except as an indication of how closely one could approach the published test results at very low frequencies by a reasonably close approximation to the original test conditions.

In Fig. 3 is shown the result of indoor frequency response measurements. The AR-1 system was located in the corner of a room and was driven from an amplifier with a damping factor of 1. This presumably would accentuate the extreme low frequencies slightly as compared to the optimum

damping factor of 4. To at least partially eliminate the effect of room resonances, readings were taken in 5 locations throughout the room at each frequency. The resultant curve is the average of the 5 readings at each frequency of measurement. Although the response curve is no longer quite as flat as it was in the outdoor measurements, it is much smoother than the curves we have obtained with other speaker systems.



We measured the relative efficiency of the AR-1, using white noise in the same manner as described in issue no. 9 for the other speaker systems reported on in that issue. The relative output of the AR-1 compared to the Altec 604 in its bass reflex box was down 13 db. This would suggest that the AR-1's efficiency was 1/20th that of the Altec 604. This figure is not too far out of line with the known characteristics of both speakers. The AR-1 efficiency has been stated by its manufacturer to be of the order of 1% and the Altec 604, long known as one of the most efficient speakers on the market, is generally considered to have an efficiency of 10-15%. When listening to white noise through the AR-1 system, no particular resonant frequencies are audible. In the Briggs transient test, the AR-1 did not appear to be outstanding. The resonant frequency was approximately 43 cycles which is the designed resonant frequency of the AR-1, but the amplitude of the ringing was not unusually small. At the time, we could not help comparing this to the characteristic of the National Catenoid whose ringing was non-existent, as far as our measuring equipment was concerned. Since then, we have been made aware of the fact that the horn-loading of the Catenoid (or any other good horn-loaded speaker system) essentially swamps the speaker resonance and makes it independent of the electrical driving circuit. In contrast to this, an infinite baffle such as the AR-1, or a bass reflex system is quite dependent on the nature of the electrical damping presented to it by the driving source. As we have stated in an earlier issue, we consider the electrical transient test to be of primary value in comparing different conditions of adjustment of the same speaker system. It is not practical to draw sweeping conclusions from the results of this test, when comparing one speaker system to another.

PART V - SUMMARY

As a result of extensive listening and laboratory tests, we are of the opinion that the AR-1/W is one of the outstanding low-frequency reproducers available today. It may well be the most outstanding. At any rate, we do not specifically know of any other speaker system which is

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BARD ORTHO-SONIC V/4 TONE ARM

An ideal tone arm for the reproduction of phonograph records should cause the stylus of the playback cartridge to move along the same path as the cutting stylus used in making the original recording. Since the recordings are made on lathe mechanisms which cause the cutting head to move along a radius of the record, it is obvious that conventional playback arms which are pivoted at one end cannot exactly reproduce the path of motion of the cutting head. By using a long arm with a suitable offset angle at its head, it is possible to reduce the error due to the pickup not being exactly tangent to the record groove to very small amounts, as was pointed out in Vol. 1, No. 8 of The Audio League Report. The better tone arms of today hold the tracking error to less than 2 degrees over the usable playing portion of a 12" disc. These arms are usually rather long. Typical of them would be the Pickering 190D or the Fairchild 281A, both of which are large enough to play 16" transcriptions. The shorter Fairchild 280A has slightly larger maximum tracking errors, although they are still of the order of 2 degrees. The highly unconventional design of the B-J Arm presumably results in a very small tracking error from an arm substantially smaller than the two previously mentioned.

We rather suspect that the entire business of tracking angle error has been overplayed. In some of our tests with the Bard arm, we have deliberately offset it to introduce large tracking errors. With errors of as much as 30 degrees there is no audible degradation of sound. We will investigate this matter more scientifically and completely at a later date. In the meantime, it certainly can't hurt to obtain low tracking errors if possible.

In the past, there have been many attempts to design arms which cause the pickup cartridge to move along a radius of the record. Many ingenious mechanical arrangements have been devised, but until now, they have all failed in practical application, usually because of excessive friction.

At the 1955 New York Audio Fair, the latest entry in the radial tone arm field made its appearance. It is the Bard Ortho-Sonic V/4 arm, manufactured by the Bard Record Company of New Rochelle, N. Y. Its external appearance is not unlike that of last year's ill-fated Kral arm which employed a ball bushing as the sliding member along a polished steel rod. The ball bushing had several defects which rendered it unusable for such an application. Underneath the outer housing of the Bard arm, the differences between it and the Kral arm become most obvious. A polished steel rod still serves as the track along which the cartridge carriage slides. Motion along this track is by means of 4 ball bearing assemblies arranged in two pairs. Each pair forms a V and from this assembly of 4 bearings is suspended the carriage assembly containing the cartridge. Inasmuch as the ball bearings travel along the rod with a rolling motion instead of the sliding motion of the ball bushing, there is less likelihood of excessive friction in this design. The carriage assembly suspended from the bearings contains spring contacts which make a solderless connection with any standard magnetic cartridge such as G.E., Pickering, Fairchild, etc. Such a cartridge may be mounted without screws by means of a pressure contact from the side adjusted by a small knob. This is somewhat similar to the method used in the Clarkstar arms. (On two of our test arms, this knob came loose, after a moderate amount of use. Bard informs us that the fault has been corrected and any arms on which this happens will be replaced). A cutout hole permits installation of the G.E. triple play cartridge in this arm. An adjustable counterweight is provided for varying stylus force. The arm is mounted very simply by means of two screws. Leveling adjustment is accomplished by means of two small set screws within

the base of the arm. This operation is greatly simplified by the fact that leveling is only necessary along the axis of the arm rather than along two axes, as is customary with other arms.

The Bard arm may be installed in any position around a turntable so long as the carriage is able to travel enough to play the inner and outer grooves of a 12" record. Unlike conventional pivoted and offset arms, there is no critical distance between the turntable center and the center line of the vertical pivot of the arm. Once the base has been fastened to the motor board, the arm may be adjusted vertically so that the cartridge will track the record properly. Complete directions are provided for the installation of a cartridge and subsequent leveling of the arm. Nothing could be simpler than the setting of the arm for proper tracking, since it is only necessary to orient it so that the stylus itself rides in to the center of the turntable spindle when the carriage is moved into that position. Once this has been done, the cartridge will, of necessity, track along a record radius at all times.

The Bard arm offers several operating conveniences which are unique. The cartridge is lowered to the record by a slight twist of the outer housing of the arm. When the record is completed or when it is desired to stop playing for any reason, the arm may be given a slight twist, a few degrees, which lifts the cartridge from the record, allowing it to remain in the same lateral position. If, for example, playing is interrupted for any reason, and it is desired to resume playing at the same point, the cartridge may be raised in this manner, and later a simple opposite twist of the arm will place the cartridge on the record, usually in the same groove it had previously left. This, in our opinion, is one of the handiest features we have seen in a tone arm.

Since the cartridge assembly and slide need never be handled except at the conclusion of a record, there is little chance of damaging record or stylus accidentally. An adjustable stop is provided which positions the cartridge so that it will fall in the lead-in groove of a 12" record when the carriage is lowered. The lowering is done gently and there can be no tendency for the cartridge to scrape along the record since it is never handled, once in playing position. The only time the cartridge slide is moved by hand is after the arm has been twisted to remove the cartridge from the record. When the arm is swung into playing position and the cartridge lowered, it becomes locked and cannot be accidentally moved away from this position until it has been twisted to lift the carriage from the record. When this has been done, the entire arm may be swung out of the way to permit changing the record on the turntable.

A calibrated scale is provided along the outer housing of the arm and a small plastic magnifier is mounted on the cartridge carriage. This is intended to aid the user to return to a known passage of a record, once it has been located and its position logged. This is a fine idea, but the size and position of the magnifier make this an awkward procedure.

Naturally, the most obvious question about such a radically new arm is, how low is its friction? The Audio League has tested several of the Bard Ortho-Sonic V/4 arms. The lateral friction has been found to be well below 1 gram. Starting friction may run as high as .5 grams to 1 gram, but running friction is substantially less. In the absence of very precise measuring equipment for determining these sliding and static frictions, our comparisons of these quantities with the similar parameters of Pickering and Fairchild arms has led us to the following conclusions: The friction of the Bard V/4 arm is substantially more than that of the Pickering 190D and probably somewhat greater than that of the Fairchild 281. Nevertheless, it is sufficiently low so that no difficulty is had in tracking even eccentric or warped records with stylus pressures of 3 grams, using Electro-Sonic Concert series cartridges. Examination of the stylus shoe of this cartridge, while

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tracking a record in any arm, is a very revealing indication of the nature of any friction which may be present. The extremely high compliance of the Concert series stylus assembly means that if any substantial friction exists, there will be a definite displacement of the stylus from its center or neutral position; and as the stylus restoring force becomes great enough to overcome the static friction, the cartridge would be expected to move with a slight jerky motion. We have found that, once properly installed and leveled, there is virtually no tendency for such a jerky motion to exist in the Ortho-Sonic V/4 arm. Close examination of the tracking of these cartridges has convinced us that whatever friction does exist in this arm (and we have every reason to believe it is somewhat higher than that of several good conventional arms) is still sufficiently low so that perfectly adequate tracking can be obtained with the most compliant cartridges at the very smallest stylus pressures usable with these cartridges. In fact, we found it perfectly practical to track records with a 1-gram stylus force with the ESL cartridge, although the cartridge itself requires more force than this in order to track high level passages without excessive distortion. Insofar as the ability of the stylus to stay in the groove is concerned, one gram is quite sufficient, when mounted in the Bard arm.

As supplied by the manufacturer, the cartridge carriage assembly is rigidly fastened to the V-structure of ball bearings and this entire assembly is free to slide along the rod as well as rotate about it. The latter requirement is of course necessary to take up the effect of warped records, etc. The distance between the stylus and the rod is rather short (comparable to that of the Pickering 190D). As a result, severely warped records will be reproduced with a pronounced "wow". This has also been observed with the Pickering arm, as was mentioned in Vol. 1, No. 8. It should be said, however, that few records we have seen are sufficiently warped to make this a serious problem, and the reduction of vertical mass which is associated with this short stylus-to-pivot distance is undoubtedly beneficial in reducing record wear.

There is a small screw on the side of the cartridge carriage which may be loosened to allow another set of pivots to come into play. When this is done, the cartridge carriage is free to move parallel to the record as well as to rotate about the rod. In this way, any shock or vibration which might otherwise tend to bounce the cartridge out of the groove may be "soaked up" and the result will be a slight motion of the cartridge along a tangent to the groove; rather than vertically, and therefore out of the groove. Unfortunately, in a room having a rather resilient floor, such as is quite common in modern houses, there is a strong tendency for the vibration caused by people walking in the room to move the cartridge in this manner at a rather large amplitude. The result is a disturbing "wow". For this reason, the arm is normally shipped with this set of bearings locked, in which case this "wow" problem is non-existent. It is stated in the instructions that, in installations where a non-resilient floor, such as a concrete floor, or very rigid wooden floor exists, this extra set of bearings may be put into play, with a resultant additional cushioning effect on the cartridge. We have found the Bard arm to be unusually immune to groove jumping when jarred.

Tests on the Bard Arm.

Apart from measurements of friction, the only measurements made on the arm consisted of a low frequency resonance determination with a Fairchild 220A cartridge which had been used for similar purposes with other arms we had tested. The result of this test showed the lateral mass of the Bard arm is approximately equivalent to that of the Fairchild 281 arm. This conclusion was reached

because the low-frequency resonance of the arm and cartridge mass and stylus compliance occurred at 18 cycles, which was approximately the same frequency at which this resonance was observed with the same cartridge in the Fairchild arm. Sweep frequency records were played in attempts to find other possible resonances which we thought might exist, due to the rather unusual structure of the Bard arm. No such resonances were found. In all respects which we could measure, this arm behaves electrically just as any conventional arm might be expected to. As part of our check on friction, we applied the so-called McProud tracking test, in which a 45 RPM record is played when mounted eccentrically on the turntable in such a manner that the turntable spindle is touching one side of the large center hole of the record. This is a severe test of an arm's friction and general tracking ability. The Bard Ortho-Sonic V/4 arm passed this test with no difficulty, even at the lowest stylus force. This test was performed at 33 RPM.

Summary: The Bard Ortho-Sonic V/4 Tone Arm represents a considerable advance in convenience of operation. It is the only arm we know of by means of which the playing of a record may be interrupted at any point and resumed at the same point without groping or hunting for the groove last played. Once installed, it is the safest arm, from the standpoint of prevention of record and cartridge damage, inasmuch as the hand never touches the cartridge at a time when the cartridge can be in contact with the record. It is by far the simplest arm to install, since there are no critical dimensions to be observed. It takes less space on the motor board than any other arm capable of playing a full transcription record. The overall length of the Bard arm is only 9", yet it can play a 16" transcription. It is mechanically rugged and apparently foolproof.

We have examined it carefully for evidence of weakness or disadvantage which might result from its use. The friction which, as we have stated, is somewhat higher than better conventional arms, may or may not be a significant factor in determining record wear. We rather doubt that the small amount of friction present in this arm will be a significant factor, since it passes all conventional tracking tests admirably at the lowest stylus forces. The probable life of the ball bearings and the extent to which their friction will remain low is, in our opinion, the most significant unsettled factor in evaluating this arm. Naturally, in the brief period during which we have tested the Bard arm, we have not been able to form any conclusions on this. It appears likely that if dust and grease are kept away from the bearings (and they are physically shielded from dusty atmosphere) their low friction properties should remain constant. The tendency of the locking thumbscrew to come off, mentioned earlier, has presumably been corrected.

There is another factor to be considered for the prospective purchaser of an arm. The Bard arm is not cheap. It is priced at \$44.50, which is above the price level of several excellent conventional arms. This relatively high price buys one a great deal of operating convenience. It also buys an arm which has zero tracking error. In all fairness, we must point out that there is absolutely no audible difference in the reproduction of any record when using the Bard arm, compared to any other good arm.

Therefore, the purchase of a Bard arm, as against any of several conventional arms selling at half to three-quarters its price, we feel, must be based on its substantially greater operating convenience, smaller size, and safety features, as regards record and stylus protection.

★★★★★

Note: The Audio League made a private study for the Bard Record Company on both developmental and preproduction models of their arm. Several of our suggestions for improving the arm were incorporated in production models. Our report is based entirely on tests made on three production type arms taken from stock.

AUDIO LEAGUE SPECIAL CONSULTATIONS

The Audio League occasionally tests products and issues private reports on them on a fee basis. This activity is entirely separate from the work of publishing The Audio League Report. These studies are strictly private and are not quotable by either The Audio League or its clients.

If a product which has been tested on this basis is subsequently tested for publication in the Report, we are not bound in any way by our findings in the earlier investigation. The Audio League Report only covers units from a manufacturer's regular production, while our special service may involve developmental or preproduction models.

If we report on an item which has been the subject of an earlier private investigation, we will always so state in our report.



THE AUDIO LEAGUE AT THE 1955 AUDIO FAIR

Our report on the 1954 Audio Fair proved so popular with our readers that we are again covering this outstanding audio event for the benefit of our thousands of readers who were unable to attend.

Our staff spent approximately 8 man days at the recently concluded New York Fair, during which each of us visited every exhibit at least once, and those of more than passing interest were visited repeatedly. In the following paragraphs are some of our impressions of the better and worse exhibits. Obviously, we cannot cover all of the hundred-odd exhibitors in the space allotted to us. Therefore, our comments will usually be concerned with the outstandingly good or outstandingly bad sound that we heard. Manufacturers will be listed in alphabetical order.

Audio Artisans, Inc., Hawthorne, N. Y.

An extremely compact and cleverly designed preamplifier, with separate power supply, was exhibited here. Minimum redundancy of control functions was the keynote of this unit which sells at a modest \$44.

David Bogen Company, Inc., New York, N. Y.

The new Bogen line of amplifiers, preamplifiers, receivers, tuners and turntable were attractively displayed in one of the more crowded exhibits at the Fair. It was not hard to see the reason for the crowd when we got a good look at the modern, clean-looking design of the newer Bogen units. Several will be tested and reported upon shortly.

The R. T. Bozak Company, Darien, Conn.

The Bozak speakers whose sound has always impressed us most favorably turned out to be as attractive to look at close up, as to listen to. The calibre of wood finishing evidenced on Bozak cabinets is of the highest order.

British Industries, Port Washington, N. Y.

As in past shows, British Industries occupied several suites, using separate facilities for exhibition of Garrard record changers and turntables, Leak amplifiers, Wharfedale speakers and R-J enclosures. The recent demonstration by Briggs at Carnegie Hall probably did much to spur popular interest in the British Industries line. We listened critically once more to the sand-loaded corner enclosure of Briggs and came away feeling that here was one of the pleasantest, most natural and easy to listen to speaker systems we have ever heard. One of the maximum power neon-bulb indicators from the Carnegie Hall concert was in use at the demonstration of the Wharfedale speaker

system. As would be expected from the power levels employed at the Carnegie Hall concert, the maximum powers used in the Audio Fair demonstration rarely exceeded 1 watt.

Brociner Electronics Corp., New York, N. Y.

In addition to the old reliable Model 4 horn and Transcendent speaker systems, Brociner this year exhibited the Lowther TPL. This obviously is a close relative of the Model 4 in basic design but employs a slightly different driver of Lowther manufacture which results in a longer horn length loading the back of the driver. As a result, the low frequency response is somewhat improved over the Model 4. They all sounded wonderful to us.

Cabinart, Brooklyn, N. Y.

The Cabinart line of speaker enclosures, including the Klipsch Rebel systems, has been enhanced by a remarkably complete line of equipment cabinets and units suitable for built-in music wall construction. These are available in kit form at a substantial saving over the assembled prices.

Cook Laboratories, Inc., Stamford, Conn.

The usual Cook binaural display was very much in evidence this year. Even more than previously, we felt that Cook's volume levels were grossly excessive. The illusion of reality which his binaural system and superb reproducing equipment makes possible is largely destroyed by much louder than life reproduction. The so-called Microfusion process apparently had not come into fruition by Fair time since Cook's new record issues were only available by advance order. Also, as in the past, we noticed that the binaural pick-up system gave considerable trouble. It didn't seem to be more than one time in three that the operator was able to start both bands in synchronism. A new radial tone arm manufactured by True-Line in Detroit was in use at the Cook exhibit.

Daystrom Electric Corporation, Poughkeepsie, N. Y.

In addition to the Crestwood tape recorders, Daystrom exhibited some attractively styled preamplifiers, FM tuners and power amplifiers, which were obviously made from Heathkit components. These were assembled by Daystrom, and attired in decorator colors. The price tags reflect the many hours of work necessary to build the Heathkit preamplifier or FM tuner (\$68.95 each).

DeJur-Amsco Corporation, Long Island City, N. Y.

A rather expensive, but unusually attractive tape recorder was exhibited by DeJur. It is manufactured by Grundig in Germany. The price of \$300. for the basic mechanism takes it out of the casual party recorder class, although it superficially resembles these lower-priced units. Big claims are made for it, in the way of frequency response. Certainly its construction is superb.

Electro-Voice, Inc., Buchanan, Michigan

The Electro-Voice exhibit, which has been getting more and more crowded in recent years, reached the ultimate this year. Into the inadequately sized room were packed operating samples of each of the Electro-Voice speaker systems, plus full size cutaway units of the Georgian and Patrician. It was hard to see where any of the spectators could fit and, in fact, we had a rough time negotiating the hazards of this room. The sound was very good indeed, especially from the larger systems, such as the Georgian and Patrician.

The Elektra-Stratford Record Corp., New York, N.Y.

The manufacturer of Elektra records exhibited a pleasant-sounding miniature speaker system, selling for about \$35. This little box (less than 1 cu. ft.) offered unusually sweet and distortion-free sound, albeit without any real bass.

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Fairchild Recording Equipment Co., Whitestone, N.Y.

The complete Fairchild line was exhibited, including their cartridges, preamplifiers, 25-watt power amplifier, and a new 70-watt power amplifier. The latter is the most compact unit of its power rating that we have ever seen. Of unusual interest was a prototype of a new Fairchild turntable. This attractive unit incorporated the best features of practically every other turntable we have seen. It is belt-driven, somewhat as is the Components turntable, but employs a turret operated by a single knob for changing speeds. Selling price is reputed to be in the vicinity of \$100. and it looks like a good job at that price.

Fisher Radio Corp., Long Island City, N. Y.

The complete and most attractive 1956 Fisher line sounded excellent as usual. The new Fisher 80AZ amplifier is compactly packaged. It offers as a bonus two special gimmicks which contribute little to its utility but are of interest to the audiophile who wishes to play around. One is Z-matic, discussed in an earlier issue. The second is a neon peak-power-indicator. This might serve the purpose of convincing some audiophiles that they do not need the 30 watts this amplifier can supply.

General Electric Co., Syracuse, N. Y.

G. E. Exhibited a new 20-watt amplifier. This is novel in that it is constructed as two units which may be operated as a separate pre-amplifier and power amplifier or physically plugged together and mounted in one cabinet as a typical flat or compact single unit amplifier.

Gray Research and Development Co. Inc., Manchester, Conn.

In addition to their viscous damped arms and broadcast equalizers, Gray has entered the turntable market this year with a moderately expensive and attractive turntable. This is available with or without Gray arms.

Harman-Kardon Inc., Westbury, L. I., N.Y.

The Harman-Kardon line was displayed in most attractive surroundings. We continue to have the greatest admiration for the mechanical design and packaging of this popular line, and are now in the process of testing several Harman-Kardon equipments.

Heath Company, Benton Harbor, Michigan

This year marks the entry of the Heath Company into Audio Fair exhibition. The room was invariably so jammed that only the most persistent audiophile could make his way into its innermost corners. On exhibit were the Heath amplifiers, preamplifiers and the new FM-3 FM tuner. The latter was operating and appeared to be well designed and constructed in the typical Heath tradition. Unfortunately, at Fair time, this unit was not yet in full production. As soon as it is, the Audio League will obtain and report on the FM-3. Heath also exhibited their audio test equipment and a most pleasant-sounding bookshelf enclosure kit which sells at a modest \$39.95 complete with speakers. This looks like it might be another "best buy" in audio at this price. To our ears, it held its own most adequately against the giant Jim Lansing Hartsfield.

Interelectronics Corp., New York, N. Y.

A stunning binaural demonstration was the keynote of the Interelectronics exhibit. Two Corona-tion 40-watt amplifiers were used to drive two Bozak B-310 speaker systems. The results were impressive, to say the least. The Interelectronics line appears to offer a lot of features at a modest price. The Audio League expects to test and report on their amplifier and preamplifier in the near future.

International Electronics Corp., Dallas, Texas.

The Frazier-May horn-loaded loudspeakers were exhibited this year in a greatly expanded line. In addition to the two basic models of

last year, a large number of very compact and moderate priced speaker systems and combinations of speaker systems were exhibited. We listened critically and found ourselves at times impressed and at times left rather cold by the sound we heard from these units. We suspect they would bear further investigation, since the Audio Fair environment is not the best for judging a new loudspeaker system.

Karlson Associates, Inc., Brooklyn, N. Y.

In addition to the old standbys of the Karlson 15" and 12" enclosures, the 8" model was exhibited and demonstrated this year for the first time. As always, it sounds impressive in a demonstration. We felt a little sorry for Karlson Associates in this year's decibel contest. In spite of their 70-watt Scott amplifier, and their most valiant efforts, they were definitely outclassed volume-wise by the 200-watt Stan White exhibit next door.

Klipsch and Associates, Hope, Arkansas.

As usual, Paul Klipsch exhibited with a K-horn in one corner and a Shorthorn in the other. Binaural tapes provided his only program material. We can't vouch for the sound of his system on the basis of anything we heard there, since most of the time it was at inaudible levels. We believe that Klipsch represents one extreme of exhibiting philosophy as contrasted to the other of "pour on the db and devil take the hindmost". Nevertheless, we enjoyed listening to Mr. Klipsch's comments on his speaker systems and on others.

James B. Lansing Sound, Inc., Los Angeles, Calif.

The full line of Jim Lansing speakers was well presented. We still do not like the Hartsfield. We heard better sound than it produced from many other Jim Lansing units, to say nothing of those of other make.

Marantz Co., Long Island City, N. Y.

The Marantz preamplifier has established an enviable reputation in the past several years. One look at the unit, spread out on the bench, is sufficient to show why. Its internal appearance is gem-like, in contrast to the typical mass-produced electronic equipment we are accustomed to seeing. This year, Marantz introduced a 40-watt power amplifier, built to the same standards as his pre-amplifier. Its a beauty.

R. I. Mendels, Inc., New York, N. Y.

This importer exhibited the Matsushita Panasonic speaker. This is Japan's first entry into the American hi-fi market. It is a moderately expensive (\$25.) 8" speaker. The sound in Cabinart Rebel enclosures left little to be desired. It seems to us that this should take a high position among quality 8" speakers.

McIntosh Laboratory, Inc., Binghamton, N. Y.

The new McIntosh MC-30 and MC 60 amplifiers were exhibited. These units show definite signs of design tailored for the home, in contrast to the original McIntosh design which was slanted toward industrial and laboratory use. They are beautiful looking and beautiful performing amplifiers. Also exhibited were turntables by Microlab of Canada. These are imported by McIntosh. They are competitively priced with American turntables. Microlab also exhibited an arm which appeared to have many similarities to the GE and Pickering arms. Most of the features of the latter have been retained with the counterbalance system of the GE. Price, in the \$30. region.

Westminster Recording Company, Inc., New York,

Westminster records were again played through a Varkon speaker system (see Vol. 1, No. 2). This year the Varkon was of a production model, slightly different in physical form than last year's model. Sound, as before, was superb.

truly comparable to it from the standpoint of extended low frequency response, flatness of response, and most of all, low distortion. The high frequency portion of the AR-1 system, while excellent by most standards, is not nearly so superlative a mechanism as the low-frequency portion. For this reason, there might be room for argument as to whether the AR-1 system is the finest speaker system made today. We do not think there can be any argument with the statement that it is one of the finest speaker systems available today.

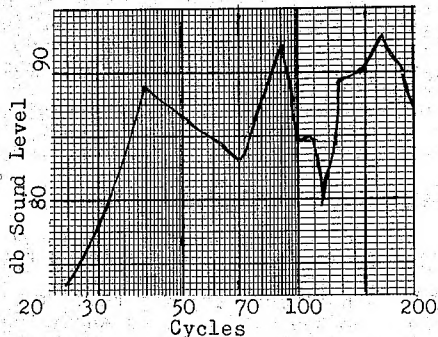


Fig. 3
ACOUSTIC RESEARCH
AR-1 SPEAKER SYSTEM
Indoor Test - Average of 5 Readings

All of this is without regard to size or price. When it is considered that the AR-1 is truly small enough to sit on a table or be mounted in a bookshelf, or to fit unobtrusively into the smallest living room, and that its complete price is only \$185., it becomes evident that the AR-1 has no competition in its price class or anywhere near it. In our experience, while not everyone hearing the AR-1 rushed out to scrap their present speaker system, there were none who did not admit its unusually smooth and clean response. We are further impressed by the extremely objective and honest statements of its manufacturer regarding its performance. This objectivity is extremely rare, especially in the speaker industry, and we wish to commend Mr. Villchur for his method of presentation of the AR-1 to the hi-fi public.

Paradoxically, we think it likely that the biggest drawbacks to the AR-1's overwhelming acceptance by the public are also its outstanding advantages, namely its low price and small size. There are many people who simply would not accept a speaker costing only \$185. as being the finest or one of the finest available to them. Many audiophiles to whom money is no object are not willing to consider a speaker system costing less than \$500. Many of these people will eventually settle for a system with a substantially lower order of performance than the AR-1 but costing several times as much and looking several times as impressive. With regard to its size, the AR-1 unfortunately looks like any of the less expensive so-called bookshelf enclosures. It is not an imposing piece of furniture. In many homes, and particularly in small apartments, its small size is unquestionably a tremendous advantage. However, in large living rooms, it frequently does not fit in with the general decor. In fact, it looks a little ridiculous at one end of a 30-ft. room. On the other hand, a speaker system standing 4 or 5 ft. high and several feet across the front can serve as an attractive piece of furniture in keeping with the general size of the room. We do not doubt that an AR-1, packaged with a false front to make it look approximately 4 or 5 times its actual size, would prove much more acceptable to a large segment of the buying public.

Apart from considerations of price or styling, the relatively narrow sound source is its biggest drawback. At high volume levels, fortunately, this effect becomes much less noticeable. It could be argued that it is advantageous to have a speaker system which fills the room from an apparently large source at high levels, yet withdraws to an apparent small source at low levels for chamber works, vocals, etc. Certainly, the performance of the AR-1 on chamber music and solo male vocal selections leaves little to be desired.



TECHNICAL CONSULTATION SERVICE

As we stated some months ago, time considerations prevent us from the general answering of individual questions regarding selection of components, etc. By charging a small fee for such services, we can hold down the number of such requests to a reasonable number. Questions not involving unusual amounts of research will be answered when accompanied by a remittance of \$5.00. Where an excessive amount of time is required, you will be advised of the cost.

This announcement is being repeated because of numerous requests for free technical advice from recent subscribers. Please bear in mind that this question-answering service cannot take priority over getting out the REPORT. There will usually be delays of a few weeks in answering your letters.



Summary of The Audio League's Impressions of the 1955 New York Audio Fair

In our opinion, the most outstanding development introduced at the recently concluded Audio Fair were the two wide-range pushpull electrostatic speaker systems - the Pickering Isophase and the Janszen 1-30. These are undoubtedly the forerunners of bigger and better electrostatic systems of the future. Judging by their performance in the mid and upper-frequency ranges, the dynamic speaker doesn't stand a ghost of a chance against them. We hear of developments going on in England of electrostatic systems which extend into the lower bass regions. When such systems become practical, conventional multi-speaker systems will become completely obsolete. This is the nearest thing to an outright prediction that we of The Audio League have made since our inception last year. Time will tell if we have been correct.

Other than these speakers, there are few startling developments at the Fair. Trends were evident. Amplifiers and tuners are being packaged in flat or compact form for table mounting. There is much evidence of thoughtful industrial design effort going into some of these units. There is also plentiful evidence of sloppy and careless design.

There is too much of a tendency on the part of speaker exhibitors to blast mercilessly at their audiences. A few notable exceptions were found here and there, but there were not enough. The Audio League wishes it was sponsor or manager of the Fair. Needless to say, there would be a few changes toward making it a better audio show.



JANSZEN 1-30 ELECTROSTATIC TWEETER

As of this time, The Audio League has not made any measurements on the Janszen electrostatic system. We have been living with it for several weeks. In the near future, we expect to measure its frequency response with several of the better wide-range microphones which have been calibrated by their manufacturers. The full report on these tests will appear in an early issue, together with a full explanation of its operating principles and construction. In the meantime, we will present our subjective judgment on the Janszen tweeter, and the description in our words as how it sounds to us.

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National Company, Inc., Malden, Mass.

As in last year's Fair, National put on a huge and elaborate display. Emphasis this year was more on their speaker systems. The superb Catenoid was demonstrated at excessive volume levels. Even we, who have found ourselves most attracted to the Catenoid in home listening tests, couldn't take too much of it at the tremendous levels used in these demonstrations. When will manufacturers realize that they will sell more speakers by demonstrating them at reasonable levels than by driving the suffering audiophile from their exhibit with hundred db levels? The junior members of the National speaker line also were demonstrated and sounded fine. They are quite similar to the Catenoid in general sound with the exception of the bass end.

Permoflux Corp., Chicago, Ill.

Here we were treated to a demonstration of "stereo-phony" sound, via the Permoflux Stereo-Vox system. This is a system in which two speakers are used, one carrying the low frequencies, and the other carrying the high frequencies, suitably phase-shifted. Permaflux advertising claims that monaural sound sources, when played on a Stereo-Vox system, will give stereo-phonic sound. This is nonsense. We trust that, in this day and age, there will be few audiophiles who will fall for such a preposterous statement. After listening to the Stereo-Vox system demonstrated in so-called "monaural" and "binaural" modes, our only conclusion was that the two conditions indeed sound different, and that more often than not, the "monaural" connection sounded the better of the two.

Pickering & Co., Inc., Oceanside, N. Y.

The Pickering fluxvalve cartridge was to be heard and seen in many exhibits throughout the Fair. From observing the difficulties experienced by its users, we formed some opinions as to its weaknesses, as well as its virtues. For one thing, it suffers badly from clogging with lint, which tends to make it skip grooves rather easily. Frequent cleaning of the stylus is necessary. As far as the sound is concerned, it seemed to be all one could ask of a pickup. In our opinion, one of the most significant developments introduced at the Audio Fair was the Pickering Iso-phase electrostatic speaker system. This is a large curved electrostatic tweeter, available in two models, which are operable down to 400 cycles and 1000 cycles respectively. They were demonstrated in conjunction with Bozak woofers. The sound was absolutely marvelous. We don't remember ever hearing any high frequency reproduction as transparent, effortless and natural as that emerging from the Iso-phase system. They have many of the characteristics of the currently produced Janszen tweeter, but are much larger. The size of the larger unit is 2 x 3 ft. This unit is expected to net for about \$200. The smaller one, 1 x 2 ft., crosses at 1000 cycles, and is expected to sell for about \$150. The power handling capacities of the two units are 50 watts and 15 watts respectively. They are of such a physical form and size that not many homes could accommodate them. Nevertheless, we look for improvements and further developments in electrostatic speakers which will overcome some of these objections. Credit must go to Pickering for a well-kept secret, as no inkling of these speakers reached us or anyone else we had spoken to, prior to Fair time.

The Radio Craftsmen, Inc., Chicago, Ill.

After undergoing internal upheavals, Craftsmen has been purchased by Precision Radiation Instruments of California. They are now back in business, with a substantial turnover of personnel, but the same line of equipment. Prices are identical to those in effect before their ill-starred direct-to-consumer sales policy. Current sales are entirely through dealers.

Rek-O-Kut Company, Long Island City, N. Y.

In addition to the full line of Rek-O-Kut turntables, two new arms were exhibited. These are 12" and 16" models, beautifully made, and priced

at an attractively low figure. If these prices are maintained in production, it will be possible to get what looks like a first class 12" professional quality arm for \$26.95 or a 16" arm for \$29.95. These arms operated with exceptional smoothness, are similar in general philosophy of design to the ESL 310 arm and have plug-in heads. They are expected to be available early next year.

Ronette Acoustical Corp., New York, N. Y.

The Ronette cartridges were demonstrated with pleasing results. A little-appreciated fact was that a Ronette crystal tweeter was hung at the ceiling of the room in a most inconspicuous manner and was used in conjunction with two separate woofer systems spaced at least 10 or 12 feet apart. The result was an admirably dispersed sound, as clean as we have ever heard. However, the only records being played were 45 rpm German popular or jazz records which were long on transients and short on anything else. It is a little hard to judge hi-fi performance from such program material.

H. H. Scott, Inc., Cambridge, Mass.

The new Scott line of amplifiers and tuners was exhibited, as well as their excellent turntable. The low priced 311 tuner aroused much interest. We have been assured that it is almost as sensitive as the much more expensive 310. We intend to find out for ourselves very shortly.

Sherwood Electronic Laboratories, Inc., Chicago, Ill.

An unusually styled line of hi-fi equipment was presented here. A 20-watt complete amplifier and preamplifier, with rather colorful two-tone leatherette cabinetry was exhibited. This unit has a number of unusual features and is currently being tested by the Audio League. Also, on exhibit, was an FM-AM tuner in matching decor whose claimed performance figures would put it in the top brackets. We will get to this one eventually, also. The three-way Forester speaker system was an interesting unit. It is a non-corner folded horn. Again, rather big claims are made for its low level of distortion. We plan to include it among our future speaker tests.

Sonotone Corp., Elmsford, N. Y.

The long-awaited 3-P ceramic cartridge was demonstrated here via the HFA 100 amplifier and Sonotone loudspeakers. The sound was excellent, we are happy to say. We are now testing the cartridge and amplifier, and will report on them in the near future.

Stan White Inc., Chicago, Ill.

To Stan White must go db honors for the 1955 Audio Fair. With brutal disregard for the nervous sensibilities of listeners, they persisted in demonstrating their gigantic 4D speaker system with a 200-watt amplifier which was driven to the utmost. So were we. There can be no denying that Stan White speakers are impressive-sounding. As to whether they are anything that we would like to live with, - we would not be able to draw any conclusions on this from any of the demonstrations made at this or the last Audio Fair. Stan White is one of the major offenders in the db battle. As we stated earlier, even Karlson came out a rather poor second in competition with them.

Tannoy, Ltd., Toronto, Canada.

The complete Tannoy line, from cartridge to speaker, was exhibited and demonstrated. The Tannoy speakers enjoy an enviable reputation. The feature of this exhibit was a gigantic enclosure and system which played at the usual ear-shattering levels. We somehow were not impressed.

Telefunken, New York, N. Y.

The Telefunken microphone needs no introduction to audiophiles. The Telefunken phonographs

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and radio set combinations would be better un-introduced. They typify the multitude of German combination units, flooding importers warehouses today. All of these units, whether they be Telefunken, Blaupunkt, Grundig, or any other make, seem to have come from the same mold. Cabinets are identical, and hideous. Sound is shrill and screeching. Dials are huge and cluttered. Prices are astronomical. We fail to see where the market for these units can possibly exist.

The Tetrad Co. Inc., Yonkers, N. Y.

As usual, Tetrad distributed literature on stylus wear and exhibited various aspects of the manufacture and care of diamond styli. To us, a perennially attractive feature of the Tetrad exhibit (apart from the eye-filling models) is the beautiful, clear sound reproduction of the Brociner Model 4 speaker so unobtrusively hidden behind the curtain. It's a good place to come into to get away from the din.

United Audio Products, New York, N. Y.

This is an importer of West German equipment. The Wigo speakers form part of their line, as does the Dual automatic record changer and record player. The latter is a most ingenious device. It is self-indexing to any record size, since the arm starts at the center of any record and rolls out on a little wheel until it falls off the edge, whereupon the wheel retracts, the stylus goes into playing position, and the record is played. In addition, the arm is locked when not in use, and automatic stylus selection for LP or standard groove records is accomplished by means of the pushbutton which initiates the playing cycle. The only drawback to this ingenious device that we could see was the fact that it includes, as part of the package, a crystal pickup of uncertain qualifications.

University Loudspeakers, Inc., White Plains, N. Y.

University offered a most interesting exhibit, consisting, in part at least, of two huge enclosures in which were mounted samples of each speaker in their line. By means of an external switch panel, any combination of these speakers could be selected and listened to. The units being listened to were visible on an illuminated display board. In this way, the listener could easily hear the degree of difference between units of the University line which differed in one or more characteristics.

Weathers Industries, Inc., Barrington, New Jersey.

The face-lifted Weathers pickup system was featured here. A new oscillator unit (inductance-tuned) and guaranteed to be stable, is a feature of this system. We have been informed by readers of ours that this new Weathers pick-up system eliminates practically all of the objections which had been raised in the past to the Weathers system. We are obtaining one for test. The reproduction was via 5 Weathers SE-100 speaker systems mounted on the walls of the room. All were playing simultaneously which sounds wonderful but gives one little chance to judge the Weathers SE-100 speaker system. We are now testing this system.

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AUDIO LEAGUE POLICY ON USE OF QUOTATIONS BY MANUFACTURERS

The Audio League believes that, when a product is found to be satisfactory or above average in performance, the public is entitled to this information. It also believes that if a product is inferior or unsatisfactory, the public is also entitled to this information. As a result of this belief, THE AUDIO LEAGUE REPORT is issued, and no pertinent fact is left out.

Manufacturers who live up to, or exceed their advertising claims, are anxious to advertise the fact that some responsible testing organization has recommended their product in one manner or another. And they deserve the right to do so. With at least three consumer services giving results of tests on high fidelity equipment (with the possibility of considerable variation in their respective findings) advertisements containing the phrase "...reports a leading consumer-testing organization" are not only confusing, but dangerously misleading. The Audio League neither needs nor desires such ambiguity. The public is entitled to know the source of such information purporting to be accurate and responsible.

The Audio League has, in the past, authorized several manufacturers to quote from our reports in their advertisements. Frankly, we welcomed an opportunity to get our name before a larger group of people than our limited advertising budget would allow. Unfortunately, in some cases, the final ad layout, combined with the use of excerpts from our reports, might lead the unwary reader to erroneous conclusions.

In addition, we unwisely allowed certain quotations from our letters to the manufacturer, which contained essentially the same information as the final report but with slightly different wording. These quotes appeared in magazine ads prior to publication of our reports, and many readers complained about this, and rightly so.

The most recent incident of this type appeared in an ad by the Bard Record Co. Due to a misunderstanding, on their part, portions of our correspondence with them were used in an ad before the release of our report. This was not authorized by us and, of course, is not truly a quote from THE AUDIO LEAGUE REPORT.

To prevent such incidents occurring in the future, the following is our policy on the use of quotes from our reports:

- 1) Quotations out of context, or which might mislead the reader, will not be permitted. To assure this, the final ad copy, including pictures, must be approved by The Audio League.
- 2) Quotations will only be permitted from our published reports (not from letters) after they have been distributed to our readers.
- 3) Any ad quoting from The Audio League Report must carry the following statement:

Authorized quotation #_____. The reader should consult Vol. _____ No. _____ (month, year) of THE AUDIO LEAGUE REPORT, Pleasantville, New York, for the complete technical and subjective report.

Any ad or promotional literature appearing after March _____, 1956, without the above statement, cannot be considered an authorized quotation from The Audio League Report.

We are aware that the entire matter of allowing manufacturers to quote from our reports is a touchy one. We urge all our readers to give us their opinion of our stated policy. A postcard with a simple "yes" or "no" will be sufficient. If it appears that a substantial number of our readers are opposed to the use of quotes by manufacturers in a responsible way, we will discontinue this policy.

Whether or not we continue to allow manufacturers to quote excerpts from our reports, we believe that any manufacturer who wishes to use complete reprints of our reports on his products, omitting nothing, should be allowed to do so.

If reprints are not supplied by us, they must be submitted to us for approval. All reprints must carry an authorization statement.

If there is one characteristic that may be said to be outstanding of the Janszen speaker, it is its uncanny smoothness and unobtrusiveness. Here is a tweeter that doesn't sound like a tweeter, in almost exactly the same manner as the AR-1/W woofer does not sound like a woofer.

One does not receive any impression of sizzling or piercing highs, as is so common with the electro-dynamic tweeters we have been accustomed to hearing. However, the great width of the Janszen speaker (23") and its unusually broad horizontal polar pattern (120°) give it a spaciousness of sound which sets it apart from most other tweeters. There is no audible pattern of directivity in the horizontal plane. However, it is moderately directional in the vertical plane, and it is best if the listener's ear is within 20° or so of the axis of the speaker in the vertical plane.

In one listening comparison made by the Audio League, a switching arrangement was used to switch between the Janszen tweeter and the Western Electric 755A tweeter of the AR-1 system, using the AR-1 woofer in both cases. It was interesting to note the great similarity of sound between the two systems and also to note the manner in which they differed. There was not an impression of augmented highs when switching to the Janszen. On the contrary, if the program material was anything less than the very best, there was no apparent difference in frequency range. This situation obtained on all FM broadcasts of recorded music. This is not surprising, since the Western Electric speaker has rather good response up to 13,000 cycles and not very much over this frequency is broadcast by FM stations using LP records. However, the rather narrow apparent source of the AR-1 system, which we commented on elsewhere in this issue, is completely modified when using the Janszen. With the Janszen speaker, the entire apparent sound source broadened out, and the effect was that of a large speaker system. With one's eyes closed, one could have no difficulty in imagining that a 30 cu. ft. monster sat in the corner instead of this 1.7 cu. ft. midget with its 1 cu. ft. tweeter perched on top.

Another, and in some ways, most surprising difference between the Janszen tweeter and the AR-1 tweeter, was the relative noise levels. The Janszen speaker, in every case, showed a lower hiss and scratch level than the Western Electric speaker. This is in spite of its response being more than 1 octave wider than that of the Western Electric. A little thought quickly shows the reason for this phenomenon. It has been pointed out previously, in the case of phonograph cartridges, that a smooth cartridge of very wide range will have a lower hiss

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level than a narrow range cartridge with peaks in its response. Similarly, a low frequency speaker system which is peak free, such as the AR-1, will not boom or introduce artificial resonances to reproduced music. By the same token, a flat tweeter, free from peaks, although its response extends beyond the range of human hearing, will have less audible high frequency noise than a tweeter of less bandwidth but having the more normal peaks and dips in its response. If no unusual amount of high frequency energy is present in the program material, the Janszen will not show its true colors. On much of the material being broadcast today, even on so-called good music stations, one would never suspect that this tweeter has such a remarkably extended frequency range. However, in our panel listening tests, some of the latest and best LP records were played, with cartridges having substantial response up and beyond 20 kilocycles. On this sort of program material, the Janszen proved to be as sparkingly different from other tweeters as the AR-1 was different from other woofers. It was not hard to forget that one was listening to a speaker system. Records with which we were quite familiar from earlier listening sounded radically different on this system. Instrumental combinations which had been submerged in a general orchestral sound on other speakers emerged with startling clarity. In every way, we judge the Janszen 1-30 to be the peer of the AR-1/W. Used in combination, they form a speaker system which ranks with the very finest.

As far as the power-handling capacity of the Janszen speaker is concerned, we tested it to its utmost in listening tests with a McIntosh MC-60 amplifier. The full power capabilities of this amplifier were employed in these listening tests, including high frequency passages involving cymbals and full orchestra. Certainly no significant distortion could be heard from either speaker.

This order of performance has its price. The Janszen system sells for \$179. in birch, or \$184. in mahogany. The utility model is \$161. This places it among the aristocracy of speakerdom in respect to price as well as performance. As in most fields, the return from such a high investment may be marginal; in other words, very good high frequency speakers are available at very much less than the price of the Janszen, as witness our comments regarding the 755-A speaker of the AR-1 system. The 755-A is in the \$25. class and on most program material, no significant difference can be heard between it and the Janszen. When the going is tough, or when unusually fine program material is available, there can be no question that a genuine improvement exists. Remember, however, that it is only suitable for use with smooth, wide-range, relatively low efficiency woofers, such as the AR-1 and Bozak units.

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